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UNITED STATES DEPARTMENT OF AGRICULTURE

Bureau of Entomology and Plant Quarantine

REPORT ON COOPERATIVE WORK ON ORIENTAL FRUIT MOTH PARASITES FOR 1937

The present report on the status of the biological control work on the oriental fruit moth project is a continuation of the annual series, the first of which appeared under date of November 15, 1934. It includes a record of the foreign importations during the year and a comparison of the field status of the parasites with that of the preceding years.

Fifteen state agencies have continued active cooperative work on this project during the year, under formal agreements. The Bureau phases of the work have continued under the direction of Dr. H. W. Allen, at the Moorestown, N. J., laboratory of the Division of Fruit Insect Investigations.

Importation and Colonization of Parasites

The following parasite species were imported from Japan and Korea during 1937, the numbers given indicating survival or emergence at destination, and were either liberated directly or utilized for rearing purposes:

Apanteles spp.	712
Bassus diversus Mues.)	
Bassus conspicuus (Wesm.))	80
Cremastus spp.	212
Dioctes molestae Uch.	21,733
Macrocentrus thoracicus (Nees.))	
Eubadizon extensor (L.))	8,255
Orgilus longiceps Mues.	1,180
Perisierola sp.	594
Phaeogenes haeussleri (Uch.)	4,872
Phanerotoma grapholithae Nees	67
Pristomerus vulnerator (Panz.)	455
Tachinidae	292
	38,452

In addition to the above, two shipments of cocoons of *Gambrus stokessi* Cam., were received from Australia, from which 49 adults emerged. Also, 5,014 adults of *Macrocentrus ancylivorus* Roh., the principal native parasite, were reared and colonized.

All of the above importations were forwarded either as adults or immature stages within the cocoons, thus eliminating the necessity for the inclusion of living host stages.

In Table 1 is given a complete list, by states, of the number of colonies of the different parasite species liberated during 1937. Those in Georgia, Kentucky, Ohio, Indiana, Michigan and Illinois were received and liberated by the cooperating agencies in those states.

BY THE BUREAU OR THROUGH COOPERATING AGENCIES, DURING 1937.

	Dioctes molestae	Macrocentrus thoracicus	Tubadizon extensor	Phaeogenes haeussleri	Bassus diversus	Orgilus longiceps	Apanteles sp.	Macrocentrus ancylivorus	Tachinidae	Gambrus stokesii	Pristomerus vulnerator	Perisierola sp.	Cremastus spp.	Phanerotoma graphiolithae	Totals
New York		6													6
New Jersey	1	1			1	1	1		1		1	1	1	1	10
Delaware										1					1
Maryland	1				1			1							3
Virginia	1			12	1			1		1					16
Georgia	1				1		1								3
Kentucky	3														3
Ohio	33	17				3	1		1						55
Indiana	12	1			1		1	1							16
Michigan	23	10			2	1	1	3	2		1				43
Illinois	29					1	1								31
Total colonies	104	35		12	7	6	6	6	4	2	2	1	1	1	187
Average number per colony	208	231		405	115	156	116	219	64	22	211	594	212	57	
Total parasites	21,625	8,080		4,863	805	938	695	1,314	257	45	423	594	212	57	39,908

Field recoveries have again been made of Dioctes molestae in a number of localities in Connecticut, New York, New Jersey, Pennsylvania and Virginia, most of these being from colonies liberated in 1935 or earlier. It thus appears that this species is definitely established at a number of points and that the parasitization attained in 1937 ranges up to 14.3 percent. Many orchards show a much higher parasitization during the season in which the releases are made.

A single definite recovery is recorded for Bassus diversus, this being at South Glastonbury, Conn., in the vicinity of orchards in which liberations had been made in 1936.

Recovery Collections

A total of 427 collections, comprising 38,802 infested peach twigs, were made in 18 states. Of this number 322 collections of 28,440 twigs were made by cooperating agencies in 15 states, the remainder being by the staff of the Moorestown station in six states, three of which were not represented by state agency collections. The number of twigs sent in by cooperating agencies is thus considerably higher than in preceding years, and 41 percent above that for 1936. The collections by the Bureau and cooperating agencies, with data on emergence, are given in Table 2.

The Bureau collections gave an emergence of 61.5 percent and those from state agencies an average of 53.7 percent, the former figure being slightly higher than in preceding years, whereas the latter figure is slightly below that for 1936. The complete rearing records by states for the combined collections are given in Table 3.

TABLE 2. - DATA ON RECOVERY COLLECTIONS - 1937
COLLECTIONS BY THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

State	Number of collections	Number twigs collected	Percent emergence
New York	12	939	71.1
New Jersey	36	4,529	57.5
Pennsylvania	14	882	67.3
Delaware	6	672	68.9
Maryland	9	743	60.4
Virginia	28	2,597	61.3
COLLECTIONS BY COOPERATING STATE AGENCIES			
Connecticut	22	1,633	53.9
Massachusetts	21	873	37.0
New York	52	4,654	63.6
Pennsylvania	0	0	
Maryland	7	799	58.2
Virginia	20	2,296	55.5
North Carolina	6	642	61.7
South Carolina	12	1,312	62.7
Georgia	2	124	65.3
Ohio	21	6,473	61.5
Indiana	36	3,334	50.8
Illinois	17	1,050	53.4
Michigan	24	2,262	45.6
Kentucky	22	2,417	24.8
Missouri	9	471	35.0
Arkansas	1	100	34.0
	427	38,802	

BY THE BUREAU AND COOPERATING AGENCIES DURING 1937.

State	No. twigs collected	Total emergence	Macrocentrus ancylivorus	Macrocentrus delicatus	Macrocentrus instabilis	Clypeata rufiscutellaris	Dioctes molestae	Eubadizon pleurale	Cremastus minor	Cremastus forbesii	Ascogaster 4-dentata	Pristomerus ocellatus	Bassus diversus	Miscellaneous
Connecticut	1,633	881	107		3	85	4	5				3	15	4
Massachusetts	873	323	4	2	6	8					1			1
New York	5,593	3,629	781		21	14	25	1	40	1	10			5
Pennsylvania	882	594	433	2		14	2			1		7		2
New Jersey	4,529	2,602	905	57	34	55	3	5		17	3	37	2	14
Delaware	672	463	369											
Maryland	1,542	914	304	36		1		1			1	14		3
Virginia	4,893	2,867	291	26	1	34	1				4	1		14
North Carolina	642	396			1									
South Carolina	1,312	823	12	66								1		6
Georgia	124	81	64											1
Kentucky	2,417	600	5	29	7			1						
Ohio	6,473	3,982	1,552	297	24	49	512		35	2	5	8		228
Indiana	3,334	1,694	194	71	3	16	117	1					3	7
Illinois	1,050	564	101	7	4		33	9						4
Michigan	2,262	1,032	176		3	276	75		2	8		4		12
Missouri	471	165		1	3			30						1
Arkansas	100	34	1	7										

The collections were made during the months of May to August, inclusive, and results indicate that the peak of parasitization was attained during August, as was the case in previous years, except 1934 and 1936. The monthly averages for the past seven years are given in Table 4.

TABLE 4. - PERCENTAGE OF PARASITIZATION, IN TWIGS, BY MONTHS, FOR 1931-37, INCLUSIVE.

	May	June	July	August	Entire season
1931	16.0	13.8	37.7	45.5	28.2
1932	7.9	14.2	40.0	50.6	28.2
1933	17.9	12.6	35.5	58.6	31.2
1934	32.5	29.8	35.3	34.1	32.9
1935	11.7	22.3	39.8	61.9	33.9
1936	13.6	14.5	29.2	16.0	18.3
1937	8.6	20.0	42.4	54.1	31.3

The above figures for 1937 are of particular interest in view of the marked decline in parasitization in 1936. The recovery from the low of that year has been most pronounced, as it will be noted that the July figure of 42.4 percent is the highest on record, and that for August, and for the season, is the third highest.

It has been pointed out in preceding reports that the yearly figures are not strictly comparable because the collections are not made in the same counties or localities each year. They are believed, however, to be comparable. The collections were made principally in orchards where parasite colonies had been released, with the object of determining establishment and buildup in parasite populations. Allowance must be made for this factor, and the figures include parasitization by introduced species which often do not persist beyond the season of colonization.

A field parasitization of 70 percent or greater was recorded during the season in the following 26 counties:

Georgia
- Habersham

Illinois
- Pulaski

Indiana
- Johnson
- Morgan

Michigan
- Berrien
- Hillsdale
- Lenawee
- Washtenaw

New York
- Schuyler

New Jersey
- Burlington
- Camden
- Gloucester
- Morris

Pennsylvania
- Adams
- Franklin

Delaware
- Kent
- Sussex

Ohio
- Ashtabula
- Clermont
- Erie
- Fairfield
- Franklin
- Lorain
- Ottawa
- Sandusky
- Summit

A total of 30 species of parasites was reared from twig-infesting fruit moth larvae. Macrocentrus ancylivorus was as usual the dominant species, showing a higher percentage of parasitization throughout the season and occurring in 68.6 percent of all orchards examined, as compared with 27.8 percent for Dioctes molestae, the next most generally recovered species. In Table 5 are given the data, by months, of the seven principal species.

TABLE 5. - MONTHLY RECORDS, BY COUNTIES, OF PARASITE OCCURRENCE, 1937.

Species	May		June		July		August		Entire season	
	Number of occurrences	Percent parasitization	Number of occurrences	Percent parasitization	Number of occurrences	Percent parasitization	Number of occurrences	Percent parasitization	Number of occurrences	Percent parasitization
ocentrus ancylivorus	6	24.0	36	43.4	36	43.4	8	53.2	86	34.7
tes molestae	1	.5	7	17.4	31	14.4	12	30.0	51	18.2
ta rufiscutellaris			10	2.4	26	10.0	11	44.1	47	15.4
ocentrus delicatus			17	9.0	17	11.9	7	21.2	41	12.3
ocentrus instabilis	2	5.4	14	3.0	14	1.8	4	7.0	34	3.1
tomerus ocellatus	2	.6	4	2.5	9	1.2	2	4.1	17	1.8
dizon pleurale			10	7.4	3	3.5			13	6.5

PLANS FOR THE 1938 SEASON

The importation of foreign parasites, which has comprised large-scale shipments from Japan and Korea since 1931, is being discontinued at least temporarily. This will make possible a much more extended study of the status of the different species which have been extensively colonized in various states during the past seven years. Certain of these species will be further reared in the laboratory and their area of distribution extended. Also, several sections in which Macrocentrus ancylivorus has not yet become established will be colonized with that species.

The investigations in Japan and Korea will be limited largely to alternate host studies, the presence of which appear to be the factor governing establishment of certain of the more promising species, and a further survey to locate sources of supply of some of the less common parasite species.

Lee A. Strong
Chief of Bureau.